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RESEARCH ARTICLE

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Global and Regional IUCN Red List Assessments: 3

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Abstract
In this contribution, the conservation status assessment of four vascular plants are presented according to IUCN categories and criteria. It includes the assessment at global level of *Crepis lacera* Ten subsp. *titani* (Pamp.) Roma-Marzio, G.Astuti & Peruzzi and *Anthyllis hermanniae* L. subsp. *sicula* Brullo & Giusso and the regional assessment of *Commicarpus plumbagineus* (Cav.) Standl. (Spain and Europe) and *Ambrosia maritima* L. (Italy).

Keywords
conservation, extinction risk, IUCN protocol, threats

Introduction

The text of the global and regional assessment should be submitted electronically to Simone Orsenigo (simone.orsenigo@unimi.it) or to Giuseppe Fenu (gfenu@unica.it); text up to 8000 characters in length (space included) must include a distribution map and a picture of the assessed species.

Crepis lacera Ten. subsp. *titani* (Pamp.) Roma-Marzio, G.Astuti & Peruzzi

Global assessment

Taxonomy and nomenclature

Order: Asterales *Family:* Asteraceae

Crepis lacera Ten. subsp. *titani* (Pamp.) Roma-Marzio, G.Astuti & Peruzzi, Phytotaxa 208(1): 50 (2015)
≡ *Crepis lacera* f. *titani* Pamp., Boll. Mus. Republ. San Marino 4: 118 (1920)
≡ *Crepis lacera* var. *titani* (Pamp.) Fiori, Nuov. Fl. Italia 2: 839 (1928)

Common name: Radicchiella del Monte Titano (It)

Geographic distribution range: *Crepis lacera* subsp. *titani* (Fig. 1) is an Italian endemic, confined to Marche (extending to San Marino Republic) and Abruzzo regions (Peruzzi et al. 2014 online updates, Roma-Marzio et al. 2015). To date, this taxon is known from 9 localities, which are split into two main groups in Central Italy that could be considered as separate sub-populations due to their geographical separation.

The northernmost group (including the *locus classicus*) is located in part within the borders of the San Marino Republic and in part within the Marche region (Natural Reserve of "Gola del Furlo"). The second one is located in southern Abruzzo (Gole del Sagittario National Reserve; Gole di San Venanzio within the Sirente-Velino Regional Park, and Vallone di Pennapiedimonte within the Majella National Park) (Roma-Marzio et al. 2015) (Fig. 2).

Distribution: Countries of occurrence: Italy and San Marino Republic

Figure 1. Individual in bud of *Crepis lacera* subsp. *titani* on limestone cliffs of Monte Titano (San Marino Republic). Photograph by L. Peruzzi.

Biology: *Plant growth form:* perennial (hemicryptophyte)
Flowering time: From May to July
Reproduction: No information on pollination strategy or seed germination is available.

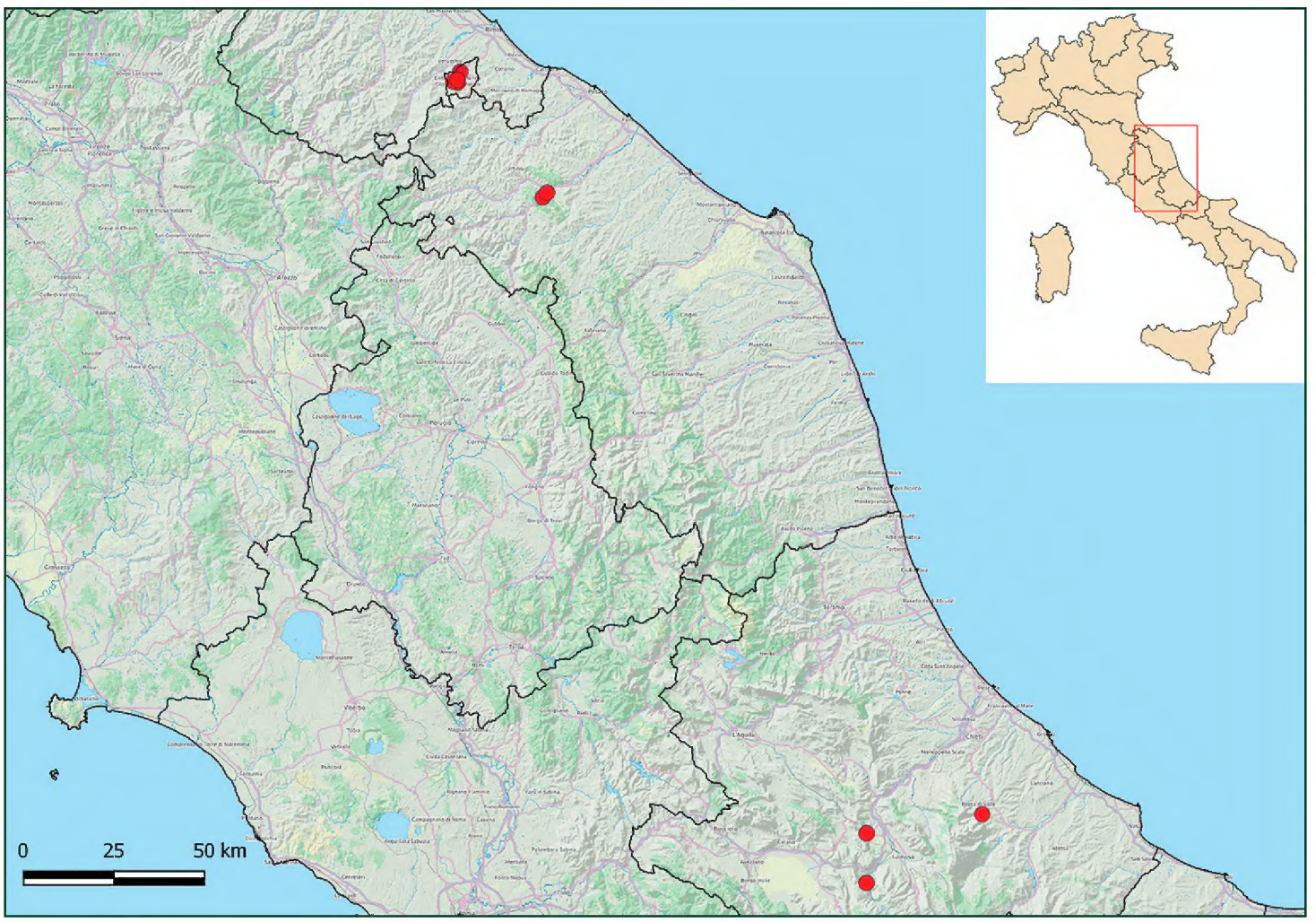

Figure 2. Geographic range and distribution map of *Crepis lacera* subsp. *titani*.

Habitat and Ecology: The preferred habitat of *Crepis lacera* subsp. *titani* is represented by stony pastures and calcareous cliffs. This species typically occurs in chasmophyte communities on limestone, assigned to the *Crepido titani-Brassicetum robertianae* Biondi & Vagge, 2004 (Biondi and Vagge 2004, Roma-Marzio et al. 2015).

Population information: There is no information available on population dynamics.

Threats: *1.1. Housing & urban areas*: some sites are threatened by the proximity to urban areas.

2.3. Livestock and farming and ranching: some sites are subjected to trampling and grazing by nomadic domestic animals.

CRITERIA APPLIED:

Criterion B: **EOO:** 4941 km^2 calculated with minimum convex hull polygon in QGIS 2.18

AOO: 28 km^2 calculated with a 2 × 2 km fixed cell grid

a) Number of locations: the following five locations have been identified according to threats 1.1 and 2.3: San Marino, Gola del Furlo (Marche region) and three other locations in Abruzzo

b) No documented decline in EOO (i), AOO (ii), area, extent and/or quality of habitat (iii), number of subpopulations (iv) or number of mature individuals (v)

c) No extreme fluctuations

Red List category and Criteria (Global Assessment)

LC	Least Concern

Rationale for the assessment: *Crepis lacera* subsp. *titani* is an Italian endemics (Roma-Marzio et al. 2015), which occurs in a few sites in Central Italy. Despite the small size of the global population, its proximity to urban areas and the potential grazing impact, there is no evidence of a decline. For this reason, this taxon is assessed as Least Concern at a global level.

Previous assessment: The taxon was not evaluated previously (NE) (IUCN 2016).

Conservation actions: Some populations of *Crepis lacera* subsp. *titani* partially occur within the Gola del Furlo Natural Reserve and Montecchio Natural Park. The localities from Abruzzo, are within the following Sites of Community Importance (SCIs): Gola del Sagittario (IT7110099), Gole di San Venanzio (IT7110096), and Maiella (IT7140203).

Conservation actions needed: To improve the management of plants occurring in pastures and urban habitats. Further monitoring efforts are needed in order to better understand population trends. *Ex situ* conservation in seed banks is recommended.

Francesco Roma-Marzio, Giovanni Astuti, Fabrizio Bartolucci, Fabio Conti, Adriano Stinca, Lorenzo Peruzzi

Anthyllis hermanniae L. subsp. *sicula* Brullo & Giusso

Global assessment

Taxonomy and nomenclature

Order: Fabales *Family:* Fabaceae

Anthyllis hermanniae L. subsp. *sicula*, Novon 16: 310 (2006).

Common name: Vulneraria spinosa di Sicilia; Spina pollice siciliana (It); Anthyllide d'Hermann sicilienne (Fr); Sicilian yellow kidney-vetch (En).

Geographic distribution range: *Anthyllis hermanniae* subsp. *sicula* was endemic of the Sicilian biogeographical province (Brullo et al. 1995). It was found by Gussone (1828) near Torre Falconara (between Gela and Licata) and Palmi (today Palma di Montechiaro). There is also an herbarium specimen collected near Terranova (today Gela) by Citarda (FI and PAL). *Anthyllis hermanniae* subsp. *sicula* now appears to be extinct as numerous field surveys have failed to find it.

Distribution: Countries of occurrence: Italy (Sicily).

Biology: *Plant growth form:* perennial (chamaephyte).

Flowering and fruiting time: From May to June, fruiting from June to July.

Figure 3. Herbarium specimen of *Anthyllis hermanniae* subsp. *sicula* (PAL herbarium)

Reproduction: No information is available on pollination, dispersal strategy and seed germination.

Habitat and Ecology: Review of herbarium specimens and the literature suggest that this taxon was restricted to calcareous substrates in a small coastal area of southern Sicily. Currently, this area is severely degraded, since both urban sprawl and agriculture have significantly transformed natural habitats. As a consequence, (sub)nitrophilous or ruderal vegetation types are widespread in the area where this plant was recorded until the nineteenth century. *Anthyllis hermanniae* subsp. *sicula* probably disappeared due to urbanization (legal and/or illegal) of the coastal areas, intense exploitation for tourism and related recreational activities, especially resorts, bathing facilities and second homes, as well as for the expansion of agriculture that has affected coastal natural habitats of southern Sicily in the last 50 years.

Population information: No information is available.

CRITERIA APPLIED:

Recent field surveys focused on finding the species in its historical area of occurrence were unsuccessful. The only existing herbarium specimens date to the nineteenth century.

Red List category and Criteria (Global Assessment)

EX	Extinct

Figure 4. Geographic range and distribution map of *Anthyllis hermanniae* subsp. *sicula.*

Previous assessment: The taxon has been already considered extinct (EX) by Brullo and Giusso del Galdo (2006)

Notes: *Anthyllis hermanniae* subsp. *sicula* belongs to a species complex which is widespread in the eastern Mediterranean, with some disjunct sometimes punctiform, ranges, in the central and western Mediterranean. In particular, the eastern populations (i.e. Montenegro, Albania, Greece, Crete, Aegean Islands and western Turkey) are morphologically relatively homogenous (*Anthyllis hermanniae* subsp. *hermanniae*), while those from the central and western Mediterranean show a remarkable morphological and ecological variability, being found on different substrates ranging from the sea level to 2,100 m a.s.l. In addition, the central-western Mediterranean populations show a very scattered distribution, and are morphologically different, especially in terms of the shape and size of the flower parts. Six subspecies (i.e. subsp. *melitensis, japygica, brutia, sicula, ichnusae,* and *corsica*) have been recognized occurring in Malta, Apulia, Calabria, Sicily, Sardinia and Corsica respectively. *A. hermanniae* subsp. *japygica* and subsp. *brutia* was classified as CR (Critically endangered) by Rossi et al (2013).

Gianpietro Giusso del Galdo

Commicarpus plumbagineus (Cav.) Standl.

Regional assessment (Spain and Europe)

Taxonomy and nomenclature

Order: Caryophyllales *Family:* Nyctaginaceae.

Commicarpus plumbagineus (Cav.) Standl. in Contr. U.S. Natl. Herb. 18(3): 101 (1916). ≡ *Boerhavia plumbaginea* Cav., Icon. 2: 7, tab. 112 (1793). ≡ *Commicarpus africanus* sensu Dandy in F.W.Andrews, Fl. Pl. Anglo-Egypt. Sudan 1: 152 (1950).

Common name: Dondiego de fruto pringoso (Es).

Geographic distribution range: *Commicarpus plumbagineus* (Fig. 5) is distributed across C and E Africa, the Middle East and the Mediterranean. In Europe, it is only found in SE Spain (Fig. 6), in the provinces of Alicante, Almeria and Murcia. In Alicante, there are three subpopulations: Sierra de Orihuela, where Cavanilles described the species (1793), Sierra de Callosa (Willkomm and Lange 1862) and Sierra de la Seldeta in the N of the province (Soler et al. 1995). In Almeria, there is a single subpopulation, which was discovered in La Sierrecica by Ruiz de la Torre and Ruiz del Castillo (1974). In Murcia, two subpopulations are known in Alhama de Murcia and Monteagudo (Esteve-Chueca 1959, Sánchez-Gómez et al. 2002). Records from Aguilas and Lorca (no available herbarium specimens) have been dismissed following intense fieldwork and taxonomical confusion has been assumed.

Distribution: Countries of occurrence: Angola, Arabia, Bahrain, Botswana, Burundi, Cameroon, Chad, Djibouti, Egypt, Eritrea, Ethiopia, Iran, Israel, Jordan, Kenya,

Figure 5. Flowers of *Commicarpus plumbagineus* in Sierra de Orihuela (Alicante, Spain). Photograph by L. Serra.

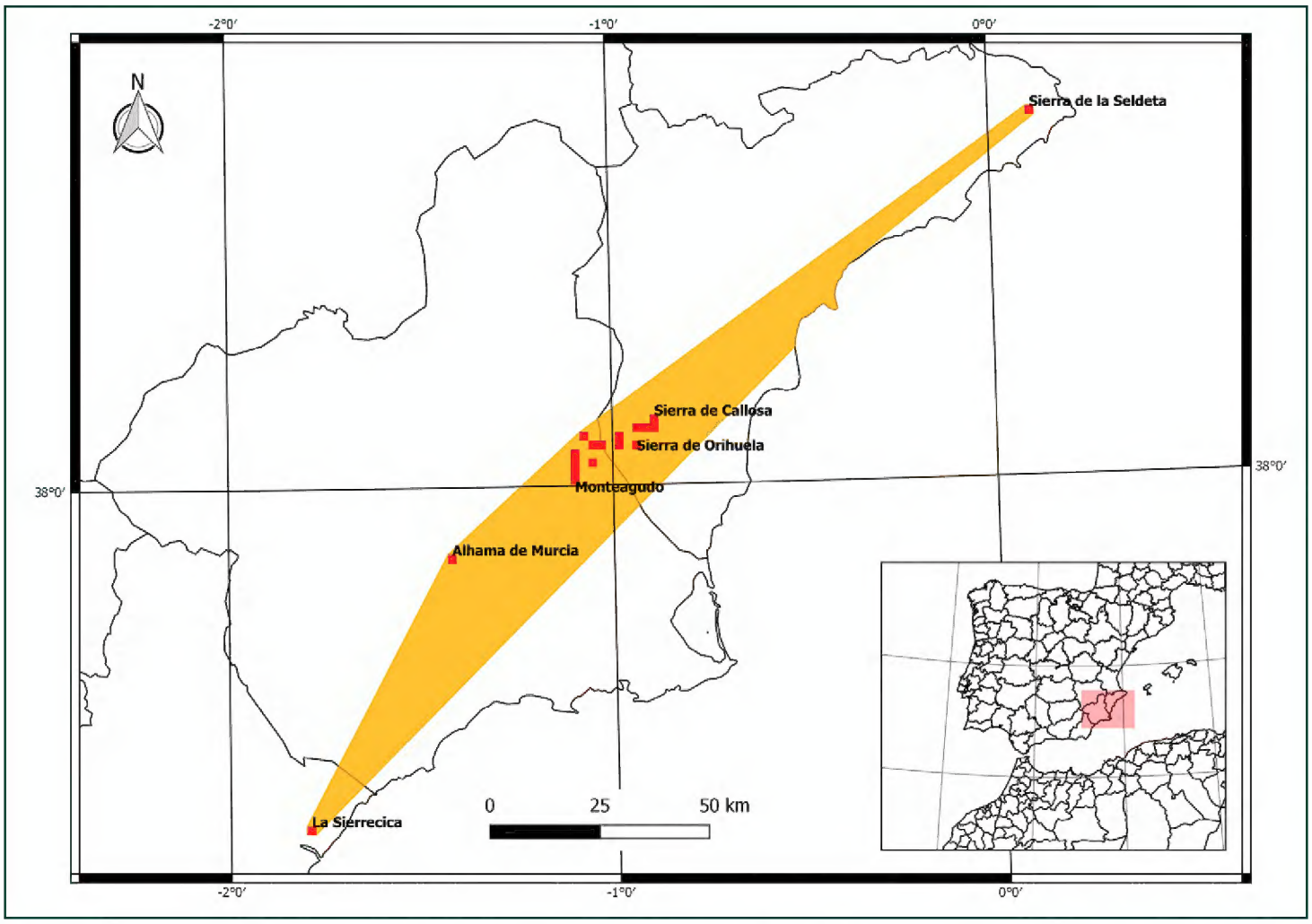

Figure 6. Extent of occurrence (orange) and area of occupancy (red) of *Commicarpus plumbagineus* in Spain.

Lebanon, Madagascar, Malawi, Mozambique, Namibia, Nigeria, Oman, Palestine, Rwanda, Saudi Arabia, Senegal, Somalia, South Africa, Spain, Sudan, Swaziland, Syria, Tanzania, Uganda, Yemen, Zaire, Zambia, Zimbabwe.

Biology: *Plant growth form:* Perennial herb (chamaephyte).

Flowering and fruiting time: From late May to November.

Reproduction: Insect pollination, zoochory.

Habitat and Ecology: *Commicarpus plumbagineus* grows at the base of dry and sunny rocky places, on diverse substrates, in subnitrophilous subrupicolous plant communities of the class *Pariarietalia* Rivas-Martínez in Rivas Goday 1964.

Population information: Censuses made between 2005 and 2015 resulted in 140 individuals in the province of Alicante, 30 in Almeria and 400-500 in Murcia.

Threats: *1.1 Housing & Urban areas:* most of the populations are close to urban areas.

2.1 Annual & perennial non-timber crops: the population in the province of Almeria is located in an intensive agricultural area.

3.2 Mining & quarrying: several populations are threatened by the expansion of quarries.

4.1 Roads & railroads: the only population in Almeria is surrounded by a road and a motorway, and the populations in Alhama and Monteagudo are close to the access routes to castles.

6.1. Recreational activities: individuals of Alicante's populations have been removed by rock-climbing activities. Hikers may also represent a threat for all populations.

7.1. Fire & Fire Suppression: in Alicante some individuals have been affected by forest fires.

8.1.2 Invasive Alien Species (named species): in Sierras de Callosa and Orihuela competition with invasive species such as *Opuntia maxima* Mill. represents a serious threat .

CRITERIA APPLIED:

Criterion D: Number of mature individuals < 1,000

Red List category and Criteria (Regional Assessment):

VU	**Vulnerable**	**D1**

Rationale for the assessment: Commicarpus plumbagineus is restricted to six European subpopulations in SE Spain. It has an extent of occurrence (EOO) of 3,062 km^2 and an area of occurrence (AOO) of 72 km^2. There is no evidence of a reduction in population size or extreme fluctuations. It lives in relatively inaccessible areas where few direct threats exist, although the proximity to urban areas and the existence of agricultural activities, quarries and roads, as well as the impact of rock-climbing may pose potential threats. The small number of mature individuals (< 1,000) and their poor recruitment capacity make it sensitive to disturbances. It is classed as Vulnerable category (VU D1) at both a national (Spain) and European level.

Previous assessment: Vulnerable (VU D2) in Moreno Saiz (2009).

Conservation actions: *Commicarpus plumbagineus* is listed as Vulnerable in the Region of Murcia legislation (50/2003 Decree) and as a Protected taxon without threat category in the Valencian Community (6/2013 Order).

Conservation actions needed: Further monitoring and research are recommended in order to better understand the reproductive biology and population trends of the species. Inclusion in the Andalusian catalogue of protected species and protection of those locations which are not yet included in protected areas are suggested.

Notes: *Boerhavia plumbaginea* Cav. was considered a synonym of *B. africana* Lour., but according to the description of Loureiro (1790: 16), *B. africana* does not belong to the *Commicarpus* genus (Meikle 1978) and is a synonym of *B. diffusa* L. However, in Spain, the name *Commicarpus africanus* (Lour.) Dandy has been used since it was published in *Flora Iberica* (Galán 1990).

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Ambrosia maritima L.

Regional assessment (Italy)

Taxonomy and nomenclature

Order: Asterales *Family:* Asteraceae

Ambrosia maritima L. Sp. Pl. 2: 988. 1753 [1 May 1753]

Common name: Ambrosia marittima (It); Sea Ambrosia or Sea Ragweed (En); Ambroisie maritime (Fr).

Geographic distribution range: *Ambrosia maritima* is endemic to the Mediterranean Basin (Tutin et al. 1976). According to Euro+Med database (Greuter et al. 2006), it occurs in almost all Mediterranean countries, even if it is likely to be extinct in France and it is doubtfully native from Morocco to Libya. Ali (2010) classifies it widespread, but its range is still unclear due to taxonomic issues and confusion with exotic American ragweed (introduced in the Mediterranean from the XIX century). Field and herbarium data suggest that it formerly occurred in several countries and it was presumably widespread in sandy coastal areas. Currently, its range is reduced to few records in Italy, Malta, Greece and Egypt.

Distribution: Countries of occurrences: Italy (Sardinia; doubtful in mainland and Sicily), Malta, Greece (Dodecanese), Egypt.

Biology: *Plant growth form:* biennial and short lived perennial (chamaephyte)

Flowering time: *Ambrosia maritima* flowers from July (August) to October; ripe fruits occur in September and October.

Figure 7. *Ambrosia maritima* in Sardinia: plants in their coastal dunes habitat, comparison between leaves of *A. maritima* and exotic ragweeds *A. artemisiifolia* (**a**) and *A. psilostachya* (**b**). Photographs by C. Montagnani.

Reproduction: Wind-pollination; preliminary tests on seed show a very low/null germination rate (unpublished data); seed primary dispersal type is barochory.

Habitat and Ecology: Based on herbarium records and field studies, *A. maritima* is restricted to coastal dunes. Ali (2010) classifies it as ruderal in Egypt, occurring also in riparian habitats. In Italy, any recent *Ambrosia* records from ruderal habitats are attributable to exotic ragweeds. In Sardinia, the only extant population grows on fixed dunes, connected to back-dune formations dominated by *Juncus* spp. Data from Italian herbarium specimens indicate that in the past it also occurred on gravel beaches and occasionally in coastal saltworks.

Figure 8. Italian distribution map of *Ambrosia maritima* based only on verified sites and *herbarium* specimens.

Population information: Populations have declined at both Italian and European levels and today a large number of records cannot be confirmed. Extinctions occurred both in historical and recent times. There is no detailed information available on population dynamics, but the number of mature individuals at each site can be extremely low and consequently its reproductive fitness limited.

Threats: *1.3. Tourism and recreational areas:* The species has recently disappeared from several sites due to building of resorts.

6.1. Recreational activities: Populations that grew near areas which are popular with tourists during the summer, may have been negatively affected by human trampling.

8.1. Invasive Non-Native/Alien Species/Disease: Historical sites which supported *A. maritima* now support large populations of *A. psilostachya* DC. (perennial ragweed) that can also colonize sandy coastal habitats.

CRITERIA APPLIED:

Criterion B: **AOO:** 4 km^2 calculated with a 2×2 km cell fixed grid
EOO: 4 km^2

a) Number of locations: one (according to threats 1.3, 6.1, 8.1)

b) Decline in EOO (i), AOO (ii), quality and extent of habitat (iii), number of subpopulations (iv).

Criterion C: small population size (<250 mature individuals), an observed continuing decline and:

a) number of mature individuals in each subpopulation <50 (i);

b) % of mature individuals in one subpopulation = 90–100% (ii)
Criterion D: Number of mature individuals <50

Red List category and Criteria (Italian Assessment)

Rationale for the assessment: according to recent data, in Italy *A. maritima* is confirmed only in one site in south-eastern Sardinia, where only two mature individuals were recorded in 2016. Not all historical sites can be confirmed. The decline has been

CR	**Critically Endangered**	**B1ab(i,ii,iii,iv)+B2ab(i,ii,iii,iv)+C2a(i,ii)+D**

estimated based on the disappearance of this *taxon* from two Sardinian sites where it was recorded at the end of the 80's. In Sardinia, the extinction of *A. maritima* is very likely due to the building of new tourist resorts. The extant population is very small in terms of spatial extension and number of mature individuals. For this reason this plant is considered as Critically Endangered at a regional level (Italy).

Previous assessment: Least Concern (LC) in Ali (2010) at Mediterranean level.

Conservation actions: *Ambrosia maritima* is not protected by international, national or regional laws. Seeds from the Sardinian population have been collected and their viability and germination tested. The Mediterranean distribution is under investigation (field and herbarium research) in order to understand where the species is still extant.

Conservation actions needed: Research activities are recommended to better understand its reproductive biology, ecology and current distribution and solve taxonomic issues; monitoring programs are strongly encouraged in order to conserve the small Sardinian population and further research should be encouraged in Mediterranean coastal areas in order to reveal possible undiscovered sites. Field research is strongly needed to verify whether the *taxon* could be present also in other parts of southern Italy (e.g. Apulia and Sicily) where the species has been reported in recent times, but findings were not supported by photographs or herbarium specimens.

Notes: Some authors consider that *A. maritima* could be an exotic ragweed introduced to the Mediterranean areas in ancient times (due to its medicinal properties). Others doubt that it is a Mediterranean endemic (Essl et al. 2015) and consider it a synonym of *A. senegalensis* from tropical Africa (The Plant List 2013). To date, the taxonomic relations of *A. maritima* L. are unclear. The misidentification of *A. maritima* increases the level of confusion with invasive American ragweeds (mainly *A. psilostachya*). This problem is mainly related to the lack of reliable identification keys. Very recently, a new identification key to ragweeds was published by the working group of the EU-Cost-Action SMARTER (Karrer et al. 2016). The oldest Italian herbarium specimen of *A. maritima* dates back at least to the XVI century (herbarium Aldrovrandi) and it might have been collected on the Adriatic sea nearby Ancona, where Aldrovandi wrote that he often found the species (http://botanica.sma.unibo.it/). Given the reduced size of the only confirmed population, *A. maritima* deserves maximum attention.

Chiara Montagnani, Rodolfo Gentili, Sandra Citterio, Giuseppe Fenu, Gianluca Nicolella, Gerhard Karrer.

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